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Federal Communications Commission
Office of the Secretary

December 19, 1991

Office of the Secretary
Federal Communications Commission
1919 M Street, NW
Washington, DC 20554

Dear Mr. Secretary:

Kindly find enclosed fifteen (15) copies of the Comments of Michael N. Liebhold on behalf of Committee on Open High Resolution Systems in FCC Docket # 87-268 and in response to Notice of Proposed Rule Making (NPRM) of 11/8.

We would appreciate it if you would signify your receipt of my Comments by hand stamping one additional copy also being delivered. I would appreciate three copies each being delivered to Chairman Sikes, as well as to Commissioners Barrett, Duggan, Marshall, and Quello.

Your cooperation is appreciated.

Sincerely,

Michael N. Liebhold
Manager, Media Architecture Research
Advanced Technology Group
Apple Computer, Inc.

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DEC 20 1991

Federal Communications Commission
Office of the Secretary

15 December 1991

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of
Advanced Television Systems
and Their Impact Upon the
Existing Television Broadcast
Service

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MM Docket No. 87-268

COMMENTS OF
MICHAEL N. LIEBHOLD

This submission is directed to Paragraph 47: Compatibility With Other Media, and supplementary to my letter to Chairman Sikes and accompanying memorandum¹ dated May 7, 1991 submitted on behalf of the Committee on Open High Resolution Systems (COHRS) as cited in the Notice of Proposed Rule Making.

This submission is presented in continuing support of the recommendations therein that the qualities of interoperability, extensibility, scalability and harmonization be included as essential criteria for the establishment of an American over-the-air ATV broadcast system. To the best of my knowledge, the original authors of the COHRS memo still support this view. Also, to the best of my knowledge, none of the authors believe that there is any need to delay the ongoing ATV test procedure as administered by the FCC ACATS (Advisory Committee on Advanced Television Service).

I would like to thank the Commission for receiving my previous comments, and for requesting further related comments. I would also like to commend the Commission for encouraging these views to be presented and considered within the formal FCC ACATS process. As a result of the commission's leadership in this matter, both the SS/WP4 (Systems Subcommittee Task Force on Report Writing), and PS/WP4 (Planning Subcommittee - Working Party on Alternative Media Technology and Broadcast Interface) have incorporated these considerations into their ongoing work.

In that context, I recommend that procedures be initiated to evaluate the ATV candidate systems on a case by case basis to determine the degree their proposals are interoperable, extensible and scalable as defined by consensus, and harmonized with other related standards. The suggested metrics for this evaluation are: 1. Costs to the system and to other media and applications, 2. The complexity of optimized compliance, and 3. The resulting service quality. The value of the test results may be developed by weighted considerations of social and economic impacts and projected timelines.

Respectfully Submitted

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¹ For reference puposes, a copy is attached. of the 5/7/91 COHRS memo, *Selected Issues: Interoperability, Extensibility, Scalability, and Harmonization of HDTV and Related Standards*

Selected Issues: Interoperability, Extensibility, Scalability, and Harmonization of HDTV and Related Standards

Comments to The Federal Communications Commission

Prepared by
The Committee for Open High Resolution Systems
Michael N. Liebhold, Editor

May 7, 1991

The following points are generally understood by many of the proponents competing for an American HDTV terrestrial broadcast standard. It is possible that, given a sufficient extension¹ to the current FCC ATV test process most, if not all, of the digital systems proposals could be modified to satisfy the following issues:

Interoperability - *The capability of operation between different video and image formats.*

Context: An intelligent HDTV system will be useful for a variety of non-broadcast high definition applications which might include: teleconferencing, educational video from compact discs and other mass storage, corporate training, medical diagnosis and collaboration, scientific research collaboration, and on-line commercial services like multiple-listing housing pictures, car-sales classified ads with pictures, etc.

- The specifications for any American HDTV standard should be selected to optimize, wherever possible, interoperability between broadcast television, multi-media computers, graphics workstations, color hardcopiers, video recorders, cd-rom and future mass storage devices, film recorders, film and still image color scanners, world-wide video formats, narrow and broadband computer network and interconnection protocols, satellite spectrum width, cable channel modulation schemes..

- To simplify code and hardware, and minimize costs, it is feasible to select scanning standards for HDTV as a super format which have natural relationships among: 24 frame-per-second film source material; 59.94 Hz NTSC TV; 50 Hz Pal and SECAM TV; and typical computer workstation displays operating at >70 Hz flicker rate. It is possible that a master HDTV scanning parameter could be selected (i.e. 2048x1152x72fps) which would not only minimize the costs of interoperability, but would also be attractive as a possible international standard. With proper design, this can be done without increasing costs for the typical HDTV consumer. It should be possible with scalable designs to ensure that both low-price, low feature sets and high-end sets will be practical for HDTV. *It is not clear that the FCC ATV has given serious considerations to format compatibilities with non-broadcast systems in the evaluation procedures for proposed HDTV standards.*

¹ December 19, 1991: To the best of my knowledge, none of the authors further believe that there is any need to delay the ongoing ATV test procedure as administered by the FCC ACATS (Advisory Committee on Advanced Television Service). . M. Liebhold, Editor

- **International distribution:** From the viewpoint of the health of U.S. exports, it would be extremely valuable if HDTV system parameters made it easier to sell video and films internationally. The current HDTV proposals before the FCC are designed with a relationship to NTSC, but do not have an easy conversion relationship to PAL and SECAM, nor the systems already decided upon in Europe, a market which is growing even faster than the domestic market. The European and other foreign proposals have been rejected by U.S. television and film interests for good technical reasons, and in addition, being analog systems, do not have built-in extensibility for the future nor compatibility with computer systems. However, the U.S. has an opportunity to adopt all-digital systems which would be both efficient for terrestrial spectrum and easily convertible to overseas HDTV.

Extensibility - *Ability of a video standard to incorporate extended functions over time.*

Context: We are witnessing an explosion of developments of new digital processes for video compression and communications across increasingly diverse media. How can we ensure that any HDTV standard established in the 1990s will adequately anticipate future improvements and consequent radical cost reductions for image processing? Solutions, not now part of the FCC ATV process, would include:

- Video streams which are self-identifying, so that receiving systems may intelligently decide which decoding process to apply. The use of a 'header' descriptor or 'side channel' has been proposed. This idea has received widespread enthusiastic response internationally, has been adopted by the CCIR harmonization working party, and is inherent in CCITT imaging standards for B-ISDN. It should be introduced into the ATV process in the U.S.
- Establishment of a header descriptor format for HDTV requires explicit coordination with other international bodies defining related communications, video, and multi-media document protocols especially the ISO, IEEE, and others.

Scalability - *The degree video and image formats can be combined in systematic proportions.*

Context: In order for a future intelligent HDTV system to successfully decode a variety of formats from different sources, flexible 'family' relationships between image standards could significantly reduce costs. Lower resolution pictures may be nested, or embedded within high definition pictures. These schemes would define variable (but related) rather than fixed parameters for resolution, image size, and frame rate. The parameters would depend on processor power, memory availability, and communication channel limitations permitting absolute minimum cost (and capability) consumer devices as well as extensibility for capabilities using technology not yet possible.

- It possible that such hierarchical coding schemes will enable several types of flexibility:
 1. Different "terminal devices" capable of displaying differing numbers of pixels accessing the same data stream. The quality of the picture would depend on the hardware investment chosen by the consumer, and the capabilities of the software transmitted.
 2. Reasonable picture quality maintained despite variations or interruptions in data supplied to the receiver by transmission channel. This is a critical design element for variable bit-rate networks such as B-ISDN using ATM. ((Asynchronous Transfer Mode))

3. Multiple video 'windows' of different quality source formats could be more easily displayed simultaneously on one monitor. This would permit reception on the same American HDTV set of European 50 Hz HDTV and 24 fps film (upgraded to a non-flicker rate) *without* expensive conversion.

- Variable bandwidths: It would be useful for a given HDTV signal to be able to interact with varying channel loads while sharing a channel with other HDTV signals. This is called "graceful degradation" and goes very far towards maximizing the efficiency of spectrum use, a goal which is mandated in the FCC act. Digital HDTV designs are naturally somewhat "elastic" in respect of graceful degradation and maximizing spectrum utility. However most of the current HDTV proposals do not exploit this extremely valuable elasticity with one exception (a proposal developed to be compatible with asynchronous broadband ISDN). When a channel is heavily loaded with many simultaneous picture streams, it would be useful if each picture stream were still the best that it could be within its reduced allocation of data bandwidth. When the channel is lightly loaded, it would further be useful if the high definition images using the channel could expand to provide maximum quality during the light load conditions. Research has shown that such applications are quite feasible with current technology -- analog and digital.

Such a 'family' relationship already exists among international video telephony standards (CCITT & ISO H.261), JPEG still image standards and, to a somewhat lesser degree, MPEG moving picture standards for compact disc. All four of the current FCC digital HDTV proposals are based on related coding architectures similar to these standards, but have stopped short of fully scalable implementations. Given sufficient additional time by the FCC, these proposals may be modified to incorporate much greater scalable functionality.

Harmonization: *The organization of different standards efforts into an orderly process.*

Context: At some point in the future, it is inevitable that an intelligent HDTV device will be required to process video formats from a variety of different sources including videotape, mass storage (optical & magnetic), telephone wire pairs, cable TV, direct broadcast satellites, fiber-based broadband ISDN and perhaps standards from overseas HDTV systems.

Coincident with the development of an American HDTV standard, a number of other international bodies are evaluating related imaging standards. The most important international fora are the International Telecommunication Union (ITU) and the International Organization for Standards (ISO). In the United States, ISO work on video communications is occurring in the Joint Picture Experts Group (JPEG) for compressed still images and Moving Picture Expert Group (MPEG) for compressed moving images on compact discs. For ITU issues, the US National Committee for the CCIR works on broadcast technologies, while the parallel CCITT committee works on wireline network standards such as video telephony and variable bit-rate encoded video for Broadband ISDN.

- In order to minimize costs to the consumer imaging devices, it is desirable for these emerging standards to be created in a coordinated fashion. It may not necessarily be a requirement that a future HDTV be fully backward compatible with all lower resolution formats, but at the minimum it would be in the public interest if the terrestrial HDTV standard did not *preclude* a low cost, multi-standard set. *Other than discussing other television modes (cable, DBS, etc.) the FCC ATV process, so far, has not included consideration of imaging harmonization issues in the proposed evaluation of U.S. terrestrial systems.*

The preceding information was prepared as a result of efforts by a group of individuals (known informally as COHRS - the Committee for Open High Resolution Systems) who have met and corresponded over the last two years. Much of the material here has been released previously at conferences sponsored by the National Academy of Sciences, IEEE/USA and in response to various U.S. CCIR working parties. Many of these individuals and their organizations would be willing to provide additional information to the Commission.

Michael N. Liebhold, Editor

Key contributions by the following people are gratefully acknowledged:

Gary Demos, DemoGrafx
Branko Gerovac, Digital Equipment Corporation
Chris Hamlin, Apple Computer, Inc.
Andrew Heller, Heller Computing
Eric Hoffert, Apple Computer, Inc.
Clark Johnson, Jr., Consultant
Lee Mcknight, Massachusetts Institute of Technology
Dave Nagel, Apple Computer, Inc.
Suzanne Neil, Massachusetts Institute of Technology
Donald Nelsen, Digital Equipment Corporation
Russell Neuman, Massachusetts Institute of Technology
Ken Phillips, CitiCorp and Corporate Committee of Telecom users
Ion Ratiu, International Business Machines Corporation
Anthony Rutkowski, International Telecommunication Union
Robert Sanderson, Eastman Kodak Company
Bruce Sidran, Bell Communications Research
Richard Solomon, Massachusetts Institute of Technology
Col. Will Stackhouse, Jet Propulsion Laboratories
David Staelin, Massachusetts Institute of Technology
Greg Thagard, Consultant
David Trzcinski, Hewlett Packard, Inc.
Mark Urdahl, International Business Machines Corporation
John Weaver, Liberty Television

Although the following researchers did not necessarily contribute directly to this process, their work, nonetheless, is the source of some important technical insights: Special thanks to Professors Michael Bove, Andy Lippman, William F. Schreiber, (retired), and David Tennenhouse, from the Massachusetts Institute of Technology, and Glenn Reitmeier, from the David Sarnoff Laboratories.